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Competitiveness and Integration of Product Markets

JAKOB ROLAND MUNCH jrm@dors.dk
Danish Economic Council, Adelgade 13, DK-1304 Copenhagen, Denmark

JAN ROSE SØRENSEN jsorensen@econ.au.dk
Department of Economics, Building 350, DK-8000 Aarhus C, Denmark

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Abstract

This article develops a two-country, two-sector model with imperfect competition in one sector and asymmetric labor market structures in the sense that trade unions have wage bargaining power in one country whereas the labor market is competitive in the other country. We use a new approach to model product market integration, and it turns out that the unionized country gains from integration in terms of welfare, and, if the initial level of integration is relatively low, experiences an increase in employment and investment.

One of the most topical issues at present is the economic implications of globalization or internationalization. Although it is not obvious what these concepts cover, at least one aspect is concerned with integration of product markets and the fact that firms, to a greater extent, tend to compete at international markets instead of local markets. In Europe, this process has been accelerated by the completion of the internal market, which has made it much more difficult for local firms to avoid foreign competition. In this article, we consider the effects of product market integration when labor markets are imperfectly competitive, and specifically we focus on cases where the degree of imperfection varies across the integrating economies. This, in turn, implies that the wage costs in general differ among countries.

Some observers have argued that integration of product markets may be costly in terms of lost jobs when countries with high wages and rigid labor markets integrate with countries where wages are lower. The argument is simply that firms, located in countries where wages are relatively high, are not able to compete, and the jobs will instead move to countries with lower wages. If this is true, and if income distribution is of some concern, it follows immediately that product market integration may give rise to a welfare loss in the high-wage countries. In a simple two-country model where product markets are imperfectly competitive and wages are rigid, we show that these observers may be right, and this may be so even if there is no concern for income distribution. A "sufficiently bad" competitiveness for a country (i.e., the domestic wage is "much" higher than the foreign wage) implies that product market integration leads to lower employment and a welfare loss. A country with a "good" competitiveness (i.e., the domestic wage is lower than the foreign wage) achieves an unambiguous increase in employment and welfare.

The first part of our analysis builds on the assumption that wages are exogenously determined, and this approach is in essence a partial equilibrium. In a fully fledged general equilibrium model, wages should be determined inside the model. Therefore, we also consider a case where wages are endogenous but where the labor market institutions are different in the two integrating countries. Specifically, we assume that the labor market in the high-wage country is unionized, while it is competitive in the low-wage country. Under these circumstances, we find that the employment effect of integration is still ambiguous in the high-wage country, but there is an unambiguous welfare gain in both countries. The welfare gain in the high-wage country arises because, in addition to the gain from an increase in the degree of competition in the goods market, integration implies that the labor market distortion is reduced. This is so because the trade union takes into account that firms face competitors at the world market who are more competitive in terms of wage costs. Hence, in order to protect jobs, the trade union chooses to set a lower wage. Contrary to what is usually argued, we also show that integration may give rise to a higher increase in investments in the high-wage country than in the low-wage country. The reason is that the diminishing labor market distortion has a strong impact on the investment return in the high-wage country.

In the literature, there have been several attempts to analyze the effects of product market integration when labor and product markets are imperfectly competitive, and these attempts differ on various accounts. For instance, there are different ways in which product market integration is modeled. In Driffill and van der Ploeg (1993, 1995) and Naylor (1998, 1999), integration is seen as a reduction in trade costs. Andersen and Sørensen (1993) and Danthine and Hunt (1994) assume that integration corresponds to an increase in the elasticity of substitution in consumption between domestic and foreign goods. Finally, Huizinga (1993) and Sørensen (1993, 1994) analyze the consequences of product market integration by comparing the solutions of their models when the markets in two countries are completely separated to when they are completely integrated.

The approach to modeling product market integration is very important for the results, which are seen by comparing Naylor (1998) to Huizinga (1993) and Sørensen (1993). In otherwise very similar models, Naylor finds that product market integration leads to a wage increase, while Huizinga and Sørensen find a wage decrease. In all three articles, the labor market is unionized, but in the models by Huizinga and Sørensen, product market integration gives rise to a higher degree of competition in the labor market as the trade unions in the two countries indirectly start to compete for the same jobs. In Naylor's model, firms simply face lower trade costs, and the trade unions achieve a share of the associated improved profitability through higher wages. The advantage of the approach by Naylor is that the degree of integration is measured by the trade cost parameter. Hence, it is possible to analyze the effects of a marginal change in the degree of integration. On the other hand, the Naylor approach does not capture an aspect of integration that may be essential, namely, that firms in different countries gain access to foreign markets, implying that the degree of competition in the product market increases. Huizinga and Sørensen capture the market access aspect, but they compare two very extreme regimes.

In the present article, we set up a new approach in order to model product market integration that captures the market access aspect of integration, but in which it is still possible to analyze the effects of a marginal change in the degree of integration. We assume that a certain share of the firms' products are sold in a world market that is accessible for firms in both countries, and the remaining products are sold in a home market, where only domestic firms compete. An increase in the degree of integration is then modeled as an increase in the share of goods sold in the world market. Alternatively, we could assume that a share of the consumers in each country are able to trade in the world market, whereas the rest of the consumers only trade in the domestic market. In this case, an increase in the degree of integration corresponds to an increase in the share of consumers who trade in the world market, and the two approaches lead to exactly the same results. Huizinga (1993) and Sørensen (1993, 1994) consider special cases of our approach, where the share of the firms' products sold in the world market is either zero (i.e., no integration) or one (i.e., full integration).

Another important difference with Naylor (1988) as well as with Huizinga (1993) and Sørensen (1993) is that these articles focus on the case of symmetric labor markets in the integrating economies, whereas we consider the case of asymmetric labor markets.[1] Brander and Spencer (1988) and Mezzetti and Dinopoulos (1991) also consider the case in which wages in one of the two countries are determined in a union–firm wage bargain, but they employ a trade-cost model of international oligopoly and are thus not studying the market access aspect of integration.

The rest of this article is organized as follows. In Section 1, we set up the basic model. In Section 2, we solve the model, assuming that wages are exogenously determined. In Section 3, we endogenize wages; and, finally, we have a few concluding remarks in Section 4.

1. The model

There are two countries with two sectors, and the countries are symmetric in every respect, except that the labor market institutions may be different. One sector produces under perfect competition and constant returns to scale, and the other is characterized by Cournot competition among firms.

1.1. The integration measure

Each firm in the imperfectly competitive sector produces a continuum of goods within the line $[0, 1]$, and a share, $1-\lambda$, of these goods is sold in the home market, where only domestic firms supply goods. Similarly, a share $1-\lambda$ of the goods produced by foreign firms is sold in their home market. The remaining goods (i.e., the share λ) are sold in the "world market," where firms from both countries operate. A rise in λ implies that a larger share of the goods is sold in the world market, and we will use λ as a measure of market integration. An increase in λ may be due either to removal of trade restrictions—as, for instance, by the completion of the internal market—or to technological progress, such as the development of the Internet.

The share λ is assumed to be exogenously given and identical for domestic and foreign firms. However, it is possible to provide a more rigorous microeconomic foundation for our integration measure. Munch and Sørensen (1999) develop a two-country model with symmetric labor markets, where firms incur a fixed cost if they choose to export their product. This fixed cost is assumed to differ among goods, implying that only goods yielding an operating profit from exports that covers this fixed cost are traded internationally. Now, any change that leads to a reduced fixed cost (for example, easier access to information about the foreign market) tends to increase the share of goods exported, λ. For the sake of simplicity, we take the integration parameter, λ, to be exogenous[2] and identical for the two countries, but we could along similar lines endogenize λ by incorporating a fixed cost of exporting. In order to obtain symmetry between the two country-specific λ's, one could assume that for any good, the associated fixed export cost is either high or low (for instance, normalized to zero). Integration then means that some goods change from having a high fixed export cost to having a low fixed export cost. If the gap between the high and low cost is sufficiently wide, then both domestic and foreign firms never choose to export when the fixed cost is high, and they always choose to export when the fixed cost is low.

1.2. Consumers

The utility of a representative consumer, h, in the domestic country is given as

$$U_h = \int_0^{\lambda} \left(aq(s) - \frac{1}{2}q(s)^2 \right) ds + \int_{\lambda}^{1} \left(aq^{\mathrm{d}}(s) - \frac{1}{2}q^{\mathrm{d}}(s)^2 \right) ds + bq_0, \tag{1}$$

where q_0 is consumption of the good produced in the competitive sector. This good is the numéraire good and is assumed to be internationally traded.

For $s \in [0, \lambda]$, $q(s)$ is the consumption of good s produced in the imperfectly competitive sector for the world market, and for $s \in [\lambda, 1]$, $q^{\mathrm{d}}(s)$ is consumption of good s produced for the domestic market. The utility function is linear in q_0, implying that there is no income effect in the demand for the goods produced in the imperfectly competitive sector, and we can in the usual partial way focus on what happens in this sector. Each consumer is assumed to supply one unit of labor inelastically.

We note that all goods produced in the imperfectly competitive sector enter the utility function symmetrically, and in the production process the different goods in this sector are perfect substitutes. Hence, the prices of all goods sold in the world market, p, are identical, and prices on all goods sold in the domestic market, p^{d}, are identical. Accordingly, total world market demand by domestic consumers for goods produced in the imperfectly competitive sector becomes

$$Q = (a - bp)\lambda, \tag{2}$$

while demand for goods sold at the domestic market becomes

$$Q^{\mathrm{d}} = (a - bp^{\mathrm{d}})(1 - \lambda). \tag{3}$$

Demand for goods produced in the competitive sector is

$$Q_0 = y - (ap - bp^2)\lambda - \big(ap^{\mathrm{d}} - b(p^{\mathrm{d}})^2\big)(1 - \lambda), \tag{4}$$

where y is the income of the consumer, which is assumed to be high enough to ensure a positive demand for all goods. Similarly, in the foreign country we find that

$$\tilde{Q} = (a - bp)\lambda, \tag{5}$$
$$\tilde{Q}^{\mathrm{d}} = (a - b\tilde{p}^{\mathrm{d}})(1 - \lambda), \tag{6}$$

where $\sim$ indicates a variable associated with foreign agents. The world market price is assumed always to be lower than the home market price (i.e., $p \leq p^{\mathrm{d}}$ and $p \leq \tilde{p}^{\mathrm{d}}$).

Here it should be noted that (1) we end up with exactly the same demand functions if instead there is just a single good in the imperfectly competitive sector, and (2) only a share, λ, of the consumers have access to the world market (where they of course choose to buy, since the world market price is lower than the domestic price).

1.3. Firms

The production function is linear, so the input of labor in firm i in the imperfectly competitive sector is given as

$$l_i = q_i^{\mathrm{d}} + q_i, \tag{7}$$

where q_i^{d} is total production of goods sold in the domestic market, and q_i is total production sold in the world market.

The profit in firm i becomes

$$\pi_i = p^{\mathrm{d}} q_i^{\mathrm{d}} + p q_i - w\big(q_i^{\mathrm{d}} + q_i\big) - c, \tag{8}$$

where c is a fixed setup cost. With respect to the number of firms, we consider both the case of one firm in each country and the case free entry to the sector. In the free-entry case, the number of firms is determined by zero-profit conditions in the two countries, i.e., for a domestic firm i and a foreign firm j, it must be the case that

$$\pi_i = \tilde{\pi}_j = 0, \quad \forall\, i, j. \tag{9}$$

In the competitive sector, the production function is given as

$$q_0 = l_0, \tag{10}$$

where l_0 is the labor input. This specification implies that the equilibrium wage in this sector equals the price (yielding zero profits), i.e.,

$$W_0 = 1. \tag{11}$$

Because of constant returns to scale, any number of workers can be employed in this sector at the competitive wage. This means that workers who do not find employment in the imperfectly competitive sector are employed in the competitive sector so that there is always full employment.

1.4. Wage and employment determination

With respect to the labor markets, we consider two different sets of assumptions. First, we solve for the case where wages in the imperfectly competitive sector are exogenously given at a level higher than or equal to the level in the competitive sector. Next, we consider a case where the wage in the imperfectly competitive sector in the domestic country is determined by a trade union, whereas the labor market in the foreign country is assumed to be perfectly competitive.[3] The objective function of the domestic trade union takes the form

$$\Omega = (w - 1)L, \tag{12}$$

where L is total domestic employment in the imperfectly competitive sector. Thus, the trade union aims at maximizing the surplus on top of the competitive wage. The trade union objective function is, strictly speaking, inconsistent with the utility function of the consumers. The trade union knows that the wage rate affects the product price, which in turn affects utility. However, we will assume that there are a large number of imperfectly competitive industries (which we normalize to one) and that each industry is small in comparison to the rest of the economy, implying that (12) is a reasonable approximation.[4]

1.5. Welfare

Since the competitive sector is a buffer sector, with no income effects in the demand for the goods produced in the imperfectly competitive sector as a result, we can restrict attention to the consumer, producer, and union surplus in the imperfectly competitive sector in order to analyze the welfare effects of integration. For the domestic country, welfare due to production and consumption of goods in this sector is given as

$$W = \mathrm{CS} + \Pi + \Omega, \tag{13}$$

where CS is consumer surplus in the domestic country derived from consuming goods from both the domestic market and the world market. On top of the utility from consuming the goods, there is income raised as profit, $\Pi = \sum_{i=1}^{n} \pi_i$, and wage, $\Omega = (w - 1)L$.

1.6. Game structure

The game structure of the model develops in one to three stages, depending on the specific set of assumptions used in the different cases. If the number of firms is endogenous, then Stage 1 consists of firms deciding whether to pay the setup cost and enter the market. If wages in the imperfectly competitive sector are endogenous, then they are determined in Stage 2. Finally, production is determined in Stage 3, and we assume that the outcome is a Cournot–Nash equilibrium. Clearly, when the number of firms is exogenous, the game is reduced by Stage 1, and when wages are exogenous it is reduced by Stage 2.

2. Exogenous wages

In this section, it is assumed that wages in the imperfectly competitive industry are exogenously determined. However, since workers can always find employment in the competitive sector, wages cannot be lower than one, and we assume that there is a market imperfection that enables workers to keep the wage above one. This is at least the case in the domestic country.

The model is solved by backward induction, so we proceed by considering Stage 3, which is identical for all variations of the model. In the domestic home market, the price is determined as

$$p^{\mathrm{d}} = \alpha - \frac{\beta}{(1-\lambda)} \sum_{j=1}^{n} q_j^{\mathrm{d}}, \tag{14}$$

where $\alpha = \frac{a}{b}$ and $\beta = \frac{1}{b}$. Operating profits from supplying goods at the domestic home market then becomes

$$\pi_i^{\mathrm{d}} = \left(\alpha - \frac{\beta}{(1-\lambda)} \sum_{j=1}^{n} q_j^{\mathrm{d}}\right) q_i^{\mathrm{d}} - w q_i^{\mathrm{d}}. \tag{15}$$

By maximizing profits, and applying symmetry (i.e., $q_i^{\mathrm{d}} = q_j^{\mathrm{d}}$), we find that

$$q_i^{\mathrm{d}} = \frac{1-\lambda}{(1+n)\beta}(\alpha - w). \tag{16}$$

Since total demand in the world market is Q plus $\tilde{Q}$ (see (2) and (5)), the world market price is given as

$$p = \alpha - \frac{\beta}{2\lambda}\left(\sum_{j=1}^{n} q_j + \sum_{j=1}^{\tilde{n}} \tilde{q}_j\right). \tag{17}$$

Operating profits raised from supplying goods in the world market becomes

$$\pi_i^{w} = \left(\alpha - \frac{\beta}{2\lambda}\left(\sum_{j=1}^{n} q_j + \sum_{j=1}^{\tilde{n}} \tilde{q}_j\right)\right) q_i - w q_i. \tag{18}$$

By maximizing this profit expression and a similar expression for foreign firms, and by applying symmetry among domestic firms (i.e., $q_i = q_j$) and among foreign firms (i.e., $\tilde{q}_i = \tilde{q}_j$), we find that

$$q_i = \frac{2\lambda}{(1+n+\tilde{n})\beta}(\alpha - w - \tilde{n}(w - \tilde{w})). \tag{19}$$

Total domestic employment is given as $L = n(q_i^{\mathrm{d}} + q_i)$, so substituting for q_i^{d} and q_i from (16) and (19) yields

$$L = \frac{n}{\beta}\left(\left(\frac{2\lambda}{1+n+\tilde{n}} + \frac{1-\lambda}{1+n}\right)(\alpha - w) - \left(\frac{2\lambda\tilde{n}}{1+n+\tilde{n}}\right)(w - \tilde{w})\right). \tag{20}$$

Similar expressions for production in each firm and for total employment may be found for the foreign country. Considering welfare, we first find consumer surplus. Since some of the demand is directed to the home market and some to the world market, and since the demand curve is linear in both markets, consumer surplus is given as

$$\mathrm{CS} = \frac{1}{2}(\alpha - p^{\mathrm{d}})Q^{\mathrm{d}} + \frac{1}{2}(\alpha - p)Q. \tag{21}$$

Prices must be found in order to determine CS, and by inserting (16) into (14) and (19) and a similar expression for foreign production into (17), we obtain

$$p^{\mathrm{d}} = \frac{1}{1+n}(\alpha + nw), \tag{22}$$

$$p = \frac{1}{1+n+\tilde{n}}(\alpha + \tilde{n}\tilde{w} + nw). \tag{23}$$

Recall that $p \leq p^{\mathrm{d}}$ and $p \leq \tilde{p}^{\mathrm{d}}$ by assumption. These inequalities now transform to

$$w \geq \frac{1+n}{n}\tilde{w} - \frac{1}{n}\alpha, \tag{24}$$

$$\tilde{w} \geq \frac{1+\tilde{n}}{\tilde{n}}w - \frac{1}{\tilde{n}}\alpha. \tag{25}$$

By using (8), (16), (19), and (21)–(23) in (13), we finally end up with

$$\begin{aligned} W = {} & \left(\frac{1}{2\beta}(1-\lambda)\left(\frac{n}{1+n}\right)^2 + \frac{(1-\lambda)n}{(1+n)^2\beta}\right)(\alpha - w)^2 \\ & + \frac{1}{2\beta}\lambda\left(\frac{1}{1+n+\tilde{n}}\right)^2((n+\tilde{n})\alpha - \tilde{n}\tilde{w} - nw)^2 \\ & + \frac{2\lambda n}{(1+n+\tilde{n})^2\beta}(\alpha - w + \tilde{n}(\tilde{w} - w))^2 - nc \\ & + (w-1)\frac{n}{\beta}\left(\left(\frac{2\lambda}{1+n+\tilde{n}} + \frac{1-\lambda}{1+n}\right)(\alpha - w) - \frac{2\lambda\tilde{n}}{1+n+\tilde{n}}(w - \tilde{w})\right). \end{aligned} \tag{26}$$

2.1. *One firm in each country*

Now we focus on the case of one firm in each country, i.e., $n = \tilde{n} = 1$. Employment in the imperfectly competitive industry in the domestic country thus simplifies to

$$L = \frac{(3+\lambda)(\alpha - w)}{6\beta} - \frac{2\lambda(w - \tilde{w})}{3\beta}. \tag{27}$$

An increase in the degree of integration (i.e., λ) implies that

$$\frac{\partial L}{\partial \lambda} = \frac{(\alpha - w)}{6\beta} - \frac{2(w - \tilde{w})}{3\beta}. \tag{28}$$

If production should be profitable, then wages must be lower than α. Hence, it is easily seen that, if labor markets in the two countries are identical (i.e., $w = \tilde{w}$), employment always increases. This is so because firms lose market power in the product markets when a larger share of total demand is directed to the world market.

We focus on the case where the domestic wage is higher than the foreign wage, and if

$$w > \frac{1}{5}\alpha + \frac{4}{5}\tilde{w}, \tag{29}$$

then an increase in λ gives rise to reduced domestic employment. The reason is poor competitiveness of the domestic firm, implying that the foreign firm achieves a much higher share of the world market demand than the domestic firm. The fact that the initial competitiveness of a country is essential for the employment effects of integration is similar to what is found in Andersen and Sørensen (1993). However, since our model (in principle) is a general equilibrium model, we are, contrary to Andersen and Sørensen (1993), able to find the welfare implications of integration. By inserting $n = \tilde{n} = 1$ into (26), the effect of an increase in the degree of integration becomes

$$\frac{\partial W}{\partial \lambda} = -\frac{3}{8\beta}(\alpha - w)^2 + \frac{1}{18\beta}(2\alpha - w - \tilde{w})^2 + \frac{2}{9\beta}(\alpha - 2w + \tilde{w})^2 + \frac{(w-1)}{\beta}\left(\frac{1}{6}(\alpha - w) - \frac{2}{3}(w - \tilde{w})\right). \tag{30}$$

In general, the sign of this expression is ambiguous, since there are three types of effects from integration. First, the consumers are better off because they gain access to more goods in the world market, where prices are lower. Second, the firm loses because of more competition in the goods market.[5] Finally, the workers are better off if employment increases but worse off if employment decreases.

If $w = \tilde{w}$, it is easily seen that $\frac{\partial W}{\partial \lambda}$ is unambiguously positive. In this case, the gain in utility for the consumers is greater than the loss in profits for the firm, and on top of that, workers receive a higher income due to an increase in employment. On the other hand, if w is greater than $\tilde{w}$, there will be a loss in income for the workers that can be sufficiently high to cause an overall welfare loss.[6]

We can conclude that with exogenous wages, and a given number of firms, we cannot rule out the possibility that integration of product markets gives rise to employment and welfare losses in the domestic country. Moreover, the reason for these losses is a poor competitiveness, leading to jobs moving abroad.

2.2. Free entry

In this section, we return to the model with n and $\tilde{n}$ firms in the two countries, but now it is assumed that firms, in Stage 1, enter the market until profits are driven down to zero. Combining (15) and (18) and substituting for the quantities from (16) and (19) gives the zero-profit condition for a domestic firm:

$$\pi_i = \frac{(1-\lambda)}{\beta}\left(\frac{\alpha - w}{1+n}\right)^2 + \frac{2\lambda}{\beta}\left(\frac{\alpha - w - \tilde{n}(w-\tilde{w})}{1+n+\tilde{n}}\right)^2 - c = 0. \tag{31}$$

Now consider the case where the wage rates, w and $\tilde{w}$, are equal, implying that the number of firms are equal. This is so because when wages are identical, prices in the domestic home market and the foreign home market are identical. In this case, integration leads to fewer firms in both countries, because as the importance of the more competitive world market rises, the profit level declines for a given number of firms. Hence, some firms leave the market, such that profits again are zero. This can be seen more formally by using w and $\tilde{w}$ and $n = \tilde{n}$ in (31) and totally differentiating to obtain

$$\frac{dn}{d\lambda} = -\frac{(1+n)(1+2n)(2n^2-1)}{2(1-\lambda)(1+2n)^3 + 8\lambda(1+n)^3}, \tag{32}$$

which is negative as long as there are firms in the market. Employment is increasing in the level of integration, the reason being a higher output per firm supplied to the world market. This outcome is found by differentiating (20) and using (32):

$$\frac{dL}{d\lambda} = \frac{(\alpha - w)}{\beta}\left(\frac{(1-\lambda)(1+2n)^2(1+2n+2n^2) + \lambda(1+n)^2(2+8n+4n^2)}{(1+n)(1+2n)[2(1-\lambda)(1+2n)^3 + 8\lambda(1+n)^3]}\right). \tag{33}$$

Welfare is now trivially increasing in the level of integration, since consumers are better off due to a lower price in the world market, and workers are better off due to more employment in the imperfectly competitive sector. Firms are indifferent, since they earn zero profits.

When the domestic wage rate is greater than that in the foreign country, there is an additional disadvantage for domestic firms. The second term in (31) is the operating profit from sales in the world market, and it contains a negative effect from poor competitiveness, $-\tilde{n}(w - \tilde{w})$. Therefore, for a given number of firms, as λ increases, the profit of a domestic firm decreases by a larger amount compared to the situation where wage rates are equal. This in turn leads to a larger decline in the number of domestic firms. It is, on the other hand, uncertain what happens to the number of foreign firms, since this number depends on the wage difference. If the wage rates are fairly equal, the number of foreign firms falls, but if there is a sufficiently wide wage gap, the low-wage country experiences a growing number of firms.

Our main interest is the effect of integration on employment and welfare in the high-wage country, and we have just established that the number of firms falls. This outcome has a direct negative impact on employment, but there can also be a positive effect through a higher output per firm supplied to the world market, and we already know that the latter effect dominates in the benchmark case of identical wages. Recall that employment is given by $L = n(q_i^{\mathrm{d}} + q_i)$, so by using (16) and (19) we obtain

$$\frac{dL}{d\lambda} = \frac{(1-\lambda)(\alpha - w)}{(1+n)^2\beta}\frac{dn}{d\lambda} + \frac{1+\tilde{n}}{1+n+\tilde{n}}q_i\frac{dn}{d\lambda} - \frac{2n\tilde{n}}{1+n+\tilde{n}}\frac{(w-\tilde{w})}{\beta} - \frac{n(\tilde{n}-n-1)}{(1+n)(1+n+\tilde{n})}\frac{(\alpha - w)}{\beta} - \frac{nq_1}{1+n+\tilde{n}}\frac{d\tilde{n}}{d\lambda}. \quad (34)$$

The first three terms are negative, while the fourth and fifth term have ambiguous signs[7] but also become negative when the wage gap is wide. Therefore, we can conclude that, in the case where the number of firms is determined endogenously, there is also a negative effect of integration on employment in the high-wage country when the competitive disadvantage is sufficiently large. This in turn implies, similar to what we found in Section 3.1, that the effect on welfare can be negative due to lower employment in the imperfectly competitive sector.

3. Endogenous wage determination

Now we assume that the labor market in the home country is unionized and that a trade union sets the wage rate in the imperfectly competitive sector in Stage 2. We apply the monopoly union model (see, e.g., Oswald, 1995), where the union maximizes (12) subject to the fact that employment is given by (20). The labor market in the foreign country is assumed to be competitive, implying that $\tilde{w} = 1$. We note that the difference in labor market institutions in the two countries is very extreme in the sense that a trade union has full wage-setting power in the home country, whereas trade unions have no power in the foreign country. A more realistic assumption would be that trade unions have wage-bargaining power in both countries (for instance, modeled as asymmetric Nash bargaining), but where the bargaining power of the trade unions may differ. In order to obtain closed-form solutions, we choose the more simple approach, but we would find qualitatively similar results with less extreme assumptions as long as the domestic trade union is more powerful in wage bargaining than the foreign trade union. If we carry out the maximization, the union chooses the wage rate

$$w = \frac{(1+\lambda)(1+n+\tilde{n}) + 2\lambda\tilde{n}(1+2n) + [(1+\lambda)(1+n) + (1-\lambda)\tilde{n}]\alpha}{2[(1+\lambda)(1+n+\tilde{n}) + 2\lambda n\tilde{n}]}. \tag{35}$$

Again we consider two cases—one where there is a fixed number of firms, and one where the number of firms is endogenously determined.

3.1. One firm in each country

In this case, the wage rate chosen by the trade union simplifies to

$$w = \frac{3 + 9\lambda + (3+\lambda)\alpha}{6 + 10\lambda}, \tag{36}$$

By differentiating with respect to λ we find that the wage is decreasing in the degree of integration:

$$\frac{\partial w}{\partial \lambda} = -\frac{6(\alpha - 1)}{(3 + 5\lambda)^2}. \tag{37}$$

This is so because as the two countries integrate, the rent that the union and the firm bargain over decreases due to a higher degree of competition. Put differently, the firm loses market power, implying that the union also loses market power. This is realized by the union, and the result is a lower wage rate.

We know that employment is given by (27), so by using (36) we find

$$L = \frac{(\alpha - 1)(3 + \lambda)}{12\beta}. \tag{38}$$

Thus, a higher λ leads to an unambiguous increase in employment in the unionized country for all initial levels of integration. The imperfection in the labor market caused by the trade union becomes less important as product markets integrate, i.e., the wage rate falls, and this effect is strong enough to ensure a positive impact on employment.

It is straightforward to check that the union loses (i.e., $(w-1)L$ is decreasing) when the countries integrate, and this outcome is due to the decreasing market power, but again consumers gain from integration because of the lower world market price. The firm, on the other hand, experiences a rising profit level for low λ's, and a falling profit level for high λ's. This is seen by differentiating the profit level obtained from (31) and using (36). The reason behind this outcome is a relatively large drop in the wage rate if the initial level of integration is low. For higher initial levels of integration, the wage drop is not large enough to dominate the negative effect from increased competition.

Although there are opposing effects on welfare, it is nevertheless found that the overall effect is positive. Welfare is given by (26), and, by using the fact that $n = \tilde{n} = 1$, it is easily found that this expression is unambiguously increasing in λ.

It is concluded that, in the case of one firm in each country and a trade union in the home country, we have unambiguous effects on the wage rate, employment, and welfare from integration. Employment is increasing because of increasing competitiveness of the domestic firm, i.e., a decreasing wage rate, and consumers gain enough to make the overall effect on welfare positive. In spite of the fact that we focus on a case where the labor markets are asymmetric in the two integrating economies, the effects of integration are very similar to what is found in Huizinga (1993) and Sørensen (1994).

3.2. Free entry

In this section, we again allow entry of firms such that profits are driven down to zero in Stage 1. Compared to Section 2.2, where wages were exogenously given, the setup is now more complex. The zero-profit conditions for the two countries and the endogenously determined wage rate (35) give us three nonlinear equations in three unknowns, namely, n, $\tilde{n}$, and w.

The wage is expected to fall with the degree of integration, based on the same arguments as before. The domestic firms lose market power when countries integrate, and this also means a loss of market power for the union. Hence, the wage rate must be decreasing in λ, and this outcome is confirmed by simulations. We can no longer expect the number of domestic firms to fall unambiguously, since firms could become better off due to the lower wage rate. It turns out that the number of domestic firms actually is increasing for low λ's, and moreover that investment is greater than in the foreign country.[8] The reason for the increased investment is again a relatively large drop in the wage rate for low levels of λ. For higher levels of λ, the wage drop is not sufficiently high to make the number of domestic firms increasing in λ. The results are seen in Figure 1, which presents a simulation showing a qualitatively robust picture of the effects of integration.

Substituting for the union set wage rate, (35), in the expression for employment, (20), yields

$$L = n\frac{(\alpha - 1)}{2\beta}\left[\frac{2\lambda}{1 + n + \tilde{n}} + \frac{1 - \lambda}{1 + n}\right]. \tag{39}$$

It can be shown that employment is increasing in λ for low levels of λ and decreasing for higher levels,[9] as Figure 1 suggests. This result is, of course, related to the fact that the number of firms is increasing when λ is low. As in the case with one firm in each country, the union loses from integration even though employment is increasing when λ is low, but as before we find an overall

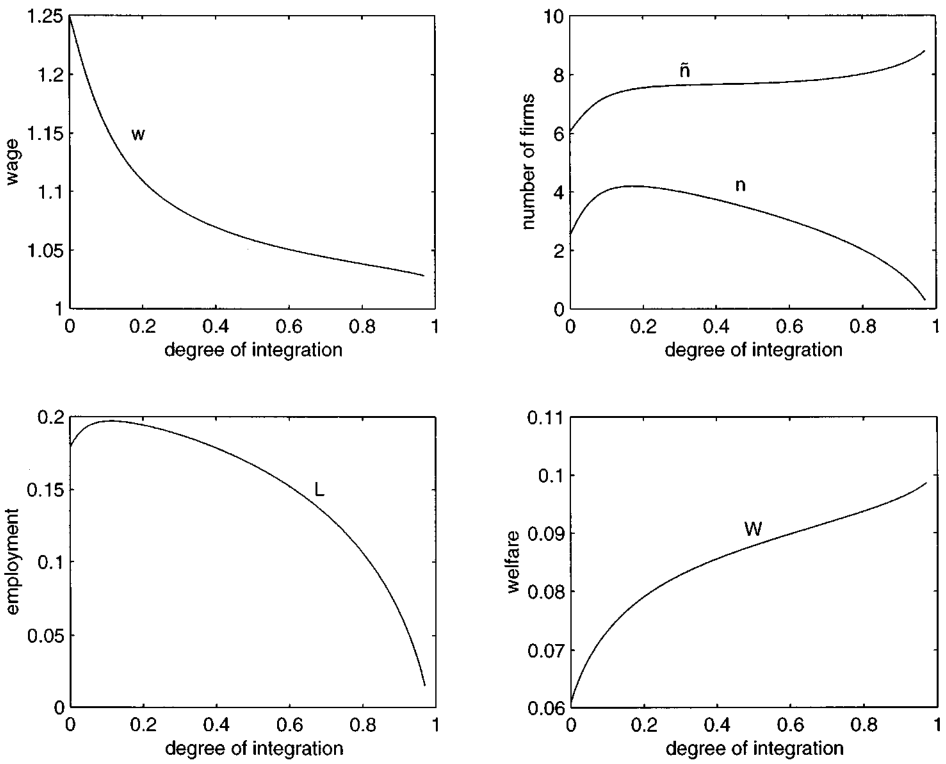

Figure 1. Effect of integration on the domestic wage, number of foreign and domestic firms, domestic employment, and welfare.

gain in welfare for all initial levels of integration. This is so because consumers gain from lower prices on the world market. We note that the qualitative effects of integration are very different from what is found in Sørensen (1994), where the comparison is between totally segmented and totally integrated markets. If product markets become totally integrated ($\lambda = 1$), there will be no firms left in the unionized country, since the existence of firms in both countries requires factor price equalization.

4. Conclusion

In this article, we have analyzed the implications of globalization in the form of increased product market integration when the labor market structures of the integrating countries are asymmetric.

Our approach to the modeling of product market integration allows us to focus on what happens between the two extreme cases of no integration and complete integration. This turns out to be of great importance, since there is not necessarily a monotonic relationship between, for instance, employment and integration.

We find that the conventional wisdom—namely, that integration is costly in terms of employment and welfare for the high-wage country—may be correct, but only when wages are unaffected by integration. When the wage in the high-wage country is determined endogenously by a trade union, we have an unambiguous welfare improvement for all initial levels of integration, and, at least at low initial levels of integration, an increase in employment and investment as well. This result is due to the loss of market power for the trade union and a decreasing wage rate as a consequence.

5. Appendix

5.1. Comparative statistics when $\lambda = 0$

We now show that n, $\tilde{n}$, and $\frac{n}{\tilde{n}}$ are increasing in λ when there initially is no integration, i.e., when $\lambda = 0$. Inserting the wage chosen by the trade union, (35), into the zero-profit condition for the domestic firms, (31), and a symmetric condition for the foreign firms, we obtain

$$\begin{aligned} c\beta(\alpha-1)^{-2} &= (1-\lambda)\left(\frac{(1+\lambda)(1+n+\tilde{n})+2\lambda\tilde{n}(1+2n)}{2(1+n)[(1+\lambda)(1+n+\tilde{n})+2\lambda n\tilde{n}]}\right)^2 \\ &\quad + 2\lambda\left(\frac{2\lambda\tilde{n}(1+2n+\tilde{n})-(1+\lambda)(\tilde{n}-1)(1+n+\tilde{n})}{2(1+n+\tilde{n})[(1+\lambda)(1+n+\tilde{n})+2\lambda n\tilde{n}]}\right), \\ c\beta(\alpha-1)^{-2} &= (1-\lambda)\left(\frac{1}{1+\tilde{n}}\right)^2 \\ &\quad + 2\lambda\left(\frac{2+3n+n^2+2\tilde{n}+n\tilde{n}+\lambda(2+3n+n^2+2\tilde{n}+3n\tilde{n})}{2(1+n+\tilde{n})[(1+\lambda)(1+n+\tilde{n})+2\lambda n\tilde{n}]}\right)^2. \end{aligned}$$

By using the fact that $\lambda = 0$ in these two equations, we find that $\tilde{n} = 2n+1$. Now we can totally differentiate the first equation and then use $\lambda = 0$ and, $\tilde{n} = 2n+1$, which yields

$$\left.\frac{dn}{d\lambda}\right|_{\lambda=0} = \frac{2(n+1)[(3n+2)(2n^2-1)+2n^2(n+1)^2]}{(3n+2)^2}.$$

Differentiating the second zero-profit condition gives

$$\left.\frac{d\tilde{n}}{d\lambda}\right|_{\lambda=0} = \frac{(n+1)(2n^4+12n^3+15n^2+12n+4)}{(3n+2)^2}.$$

These derivatives are both positive, and now we find

$$\left.\frac{d\left(\frac{n}{\tilde{n}}\right)}{d\lambda}\right|_{\lambda=0} = \frac{1}{\tilde{n}^2}\left(\tilde{n}\frac{dn}{d\lambda} - n\frac{d\tilde{n}}{d\lambda}\right)$$
$$= \frac{2(n+1)[3n^5 + 8n^4 + 4.5n^3 + (n^2-1)(8n^2+9n+2)]}{(2n+1)(3n+2)^2},$$

which also is positive. Finally, employment is increasing for low degrees of integration as well. Differentiating (39) yields

$$\left.\frac{dL}{d\lambda}\right|_{\lambda=0} = \frac{(\alpha-1)}{2\beta}\left[\frac{(3n+2)\frac{dn}{d\lambda}\big|_{\lambda=0} - n^2(1+n)}{(1+n)^2(3n+2)}\right]$$
$$= \frac{(\alpha-1)}{2\beta}\frac{(3n+2)(3n^2-2) + 4n^2(n+1)^2}{(1+n)(3n+2)^2}$$

which is positive.

5.2. *Endogenization of* λ

Now we verify that the main results in the text can be obtained in an extended model where λ is endogenous. Suppose that markets are segmented such that they are considered separately by firms and a profit-maximizing quantity is chosen for each market. Hence, there is no longer a world market but instead two local markets, one in each country, that potentially can be the subject of international competition. For the firm in the home country, a share, λ, is exported, and likewise a share, λ^*, of the foreign firms' products is exported to the home country. We restrict attention to the case of only one firm in each country, but we consider both the case of exogenous wages and that of a trade union in one country.

This setup gives rise to exactly the same profit function as in the text, when we allow for different λ's. Substituting for equilibrium quantities yields the following profit of the home firm from selling in the home and the foreign market:

$$\pi = (\lambda + \lambda^*)\frac{(\alpha + w^* - 2w)^2}{9\beta} + (1-\lambda^*)\frac{(\alpha - w)^2}{4\beta} - C(\lambda, Z),$$

where $w^* = 1$, since the labor market in the foreign market is competitive. As a novel feature, we now introduce a fixed setup cost, $C(\lambda, Z)$, that has to be paid in order to export the share λ of the firms goods. This cost function is increasing in λ and Z, so the goods can be thought of as being ranked according to rising fixed cost of trade, and Z is an integration parameter. Suppose, for simplicity, that the cost function takes the form

$$C(\lambda, Z) = \frac{(\alpha-1)^2}{36\beta} Z \log\frac{1}{1-\lambda},$$

and that a similar cost function obtains for the foreign country. Thus the fixed export cost is close to zero for goods with a low ranking (i.e., λ close to zero), and it tends toward infinity for goods in the other end of the interval.

5.2.1. Exogenous wages. Suppose that the domestic wage rate is fixed at a level higher than the competitive level in the foreign country, i.e., $w > 1$. Differentiating the profit expression for the domestic firm yields

$$\frac{\partial \pi}{\partial \lambda} = \frac{(\alpha + 1 - 2w)^2}{9\beta} - \frac{(\alpha - 1)^2}{36\beta} \frac{Z}{1 - \lambda} = 0,$$

so λ is determined as

$$\lambda = 1 - \left(\frac{\alpha - 1}{\alpha + 1 - 2w} \right)^2 \frac{Z}{4}.$$

For the foreign firm, we get

$$\frac{\partial \pi^*}{\partial \lambda^*} = \frac{(\alpha + w - 2)^2}{9\beta} - \frac{(\alpha - 1)^2}{36\beta} \frac{Z}{1 - \lambda^*} = 0,$$

and so

$$\lambda^* = 1 - \left(\frac{\alpha - 1}{\alpha + w - 2} \right)^2 \frac{Z}{4}.$$

Clearly, we have that $\lambda^* > \lambda$, and it is also seen that $\frac{\partial \lambda}{\partial w} < 0$ and $\frac{\partial \lambda^*}{\partial w} > 0$.

Welfare is given by

$$\begin{aligned} W = {} & \lambda^* \frac{(2\alpha - w - 1)^2}{18\beta} + (1 - \lambda^*) \frac{3(\alpha - w)^2}{8\beta} \\ & + (\lambda + \lambda^*) \frac{(\alpha + 1 - 2w)^2}{9\beta} - \frac{(\alpha - 1)^2}{36\beta} Z \log \frac{1}{1 - \lambda} \\ & + (w - 1) \left((\lambda + \lambda^*) \frac{\alpha + 1 - 2w}{3\beta} + (1 - \lambda^*) \frac{\alpha - w}{2\beta} \right), \end{aligned}$$

and, as in the text, it is in this setup still possible to have welfare reductions when countries integrate. Figure 2 plots welfare against λ, where λ, λ^* and W are determined simultaneously for a given value of Z.

5.2.2. Endogenous wage determination. Wage and employment determination in the home country yields the following outcome:

$$\begin{aligned} w &= \frac{(3 - \lambda^* + 2\lambda)\alpha + 6\lambda + 3\lambda^* + 3}{8\lambda + 2\lambda^* + 6}, \\ L &= \frac{(2\lambda - \lambda^* + 3)\alpha - 3 + \lambda^* - 2\lambda}{12\beta}. \end{aligned}$$

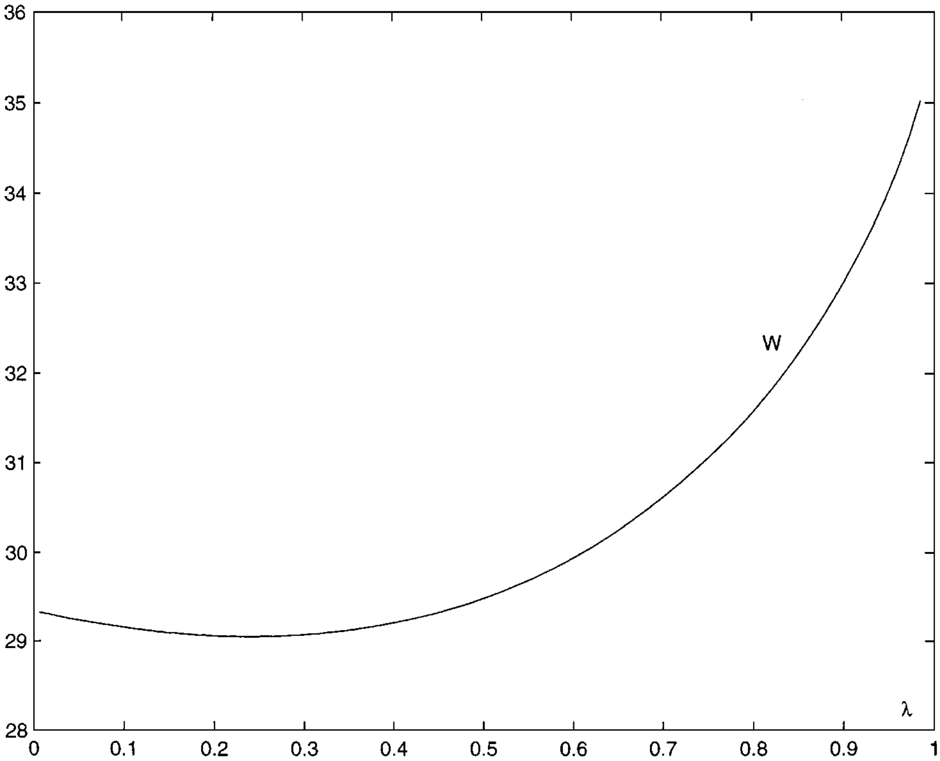

Figure 2. Domestic welfare as a function of λ. $\alpha = 10$, $\beta = 1$, $w = 1.1$.

We get that

$$\frac{\partial w}{\partial \lambda} = -\frac{3(\alpha - 1)(1 - \lambda^*)}{(4\lambda + \lambda^* + 3)^2},$$
$$\frac{\partial w}{\partial \lambda^*} = -\frac{3(\alpha - 1)(\lambda + 1)}{(4\lambda + \lambda^* + 3)^2},$$

so clearly $|\frac{\partial w}{\partial \lambda^*}| > |\frac{\partial w}{\partial \lambda}|$. The profit of the home firm now is

$$\pi = \frac{4}{9}\frac{(\alpha - 1)^2}{\beta}\frac{(\lambda + \lambda^*)^3}{(4\lambda + \lambda^* + 3)^2} + \frac{9}{16}\frac{(\alpha - 1)^2}{\beta}\frac{(1 - \lambda^*)(2\lambda + \lambda^* + 1)^2}{(4\lambda + \lambda^* + 3)^2} - C(\lambda, Z),$$

and profit of the foreign firm is

$$\pi^* = (\lambda + \lambda^*)\frac{(\alpha + w - 2)^2}{9\beta} + (1 - \lambda)\frac{(\alpha - 1)^2}{4\beta} - C(\lambda^*, Z)$$
$$= \frac{1}{36}\frac{(\alpha - 1)^2}{\beta}\frac{(\lambda + \lambda^*)(10\lambda + \lambda^* + 9)^2}{(4\lambda + \lambda^* + 3)^2} + \frac{1}{4}(1 - \lambda)\frac{(\alpha - 1)^2}{\beta} - C(\lambda^*, Z).$$

The derivatives are given by

$$\frac{\partial\pi}{\partial\lambda} = \frac{4}{9}\frac{(\alpha-1)^2}{\beta}\frac{(\lambda+\lambda^*)^2(4\lambda-5\lambda^*+9)}{(4\lambda+\lambda^*+3)^3} + \frac{9}{4}\frac{(\alpha-1)^2}{\beta}\frac{(1-\lambda^*)^2(2\lambda+\lambda^*+1)}{(4\lambda+\lambda^*+3)^3} - C_\lambda$$
$$= \frac{1}{36}\frac{(\alpha-1)^2}{\beta}\frac{16(\lambda+\lambda^*)^2(4\lambda-5\lambda^*+9)+81(1-\lambda^*)^2(2\lambda+\lambda^*+1)}{(4\lambda+\lambda^*+3)^3} - C_\lambda$$

and

$$\frac{\partial\pi^*}{\partial\lambda^*} = \frac{1}{36}\frac{(\alpha-1)^2}{\beta}(10\lambda+\lambda^*+9)\frac{28\lambda^2+2\lambda^*\lambda+54\lambda+\lambda^{*2}+27}{(4\lambda+\lambda^*+3)^3} - C_\lambda.$$

The two first-order conditions for λ and λ^* (i.e., $\frac{\partial\pi}{\partial\lambda}=0$ and $\frac{\partial\pi^*}{\partial\lambda^*}=0$) give two nonlinear equations in λ and λ^* that can be solved numerically for different values of Z:

$$16(\lambda+\lambda^*)^2(4\lambda-5\lambda^*+9)+81(1-\lambda^*)^2(2\lambda+\lambda^*+1) = \frac{(4\lambda+\lambda^*+3)^3 Z}{1-\lambda},$$
$$(10\lambda+\lambda^*+9)(28\lambda^2+2\lambda^*\lambda+54\lambda+\lambda^{*2}+27) = \frac{(4\lambda+\lambda^*+3)^3 Z}{1-\lambda^*},$$

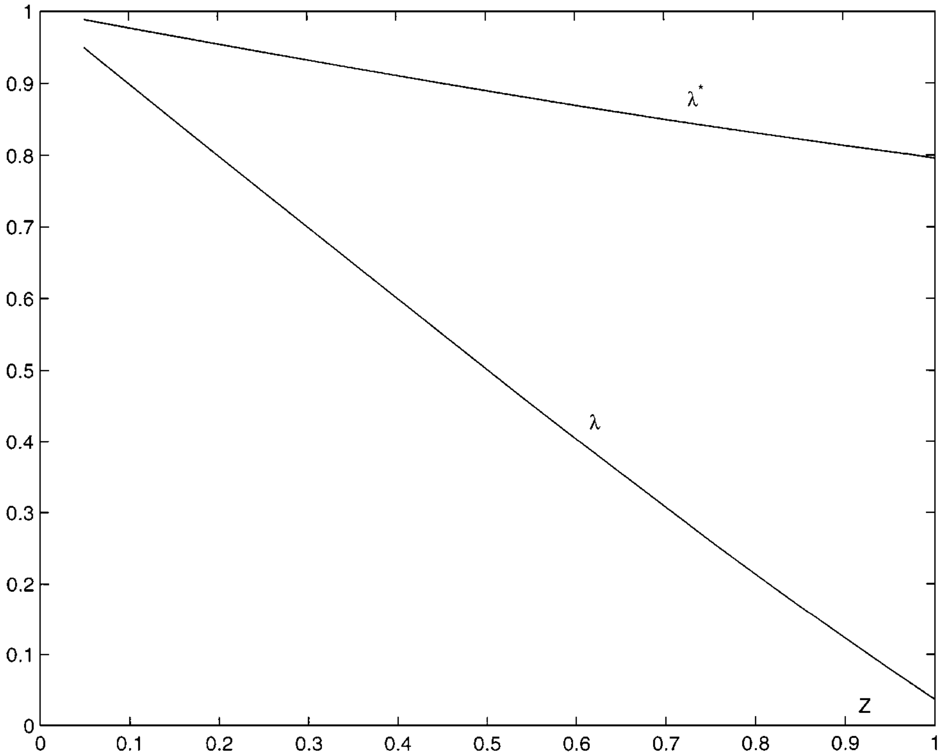

Figure 3. λ and λ^* as a function of fixed trade costs, Z.

Figure 3 presents such a simulation, and it is seen that λ and λ^* both increase as Z is reduced.

By substituting for appropriate expressions, we find that welfare is given by

$$\begin{aligned} W = {} & \frac{1}{72}\frac{(\alpha-1)^2}{\beta}\lambda^*\frac{(14\lambda+5\lambda^*+9)^2}{(4\lambda+\lambda^*+3)^2} + \frac{9}{32}\frac{(\alpha-1)^2}{\beta}(1-\lambda^*)\frac{(2\lambda+\lambda^*+1)^2}{(4\lambda+\lambda^*+3)^2} \\ & + \frac{4}{9}\frac{(\alpha-1)^2}{\beta}\frac{(\lambda+\lambda^*)^3}{(4\lambda+\lambda^*+3)^2} + \frac{9}{16}\frac{(\alpha-1)^2}{\beta}\frac{(1-\lambda^*)(2\lambda+\lambda^*+1)^2}{(4\lambda+\lambda^*+3)^2} \\ & + \frac{(\alpha-1)^2}{\beta}\frac{1}{24}\frac{(3-\lambda^*+2\lambda)^2}{4\lambda+\lambda^*+3} - C(\lambda, Z). \end{aligned}$$

We are now in a position to investigate how employment, the wage rate, profit, and welfare vary with λ (through changes in Z). Figure 4 shows the numerical calculations, and it is seen that the main results of Section 3.1 carry through to this extended model. The wage rate falls and employment rises as λ increases. Contrary to the result in the text, the profit level of the home firm now increases for all initial levels of integration. Finally, welfare is increasing as well.

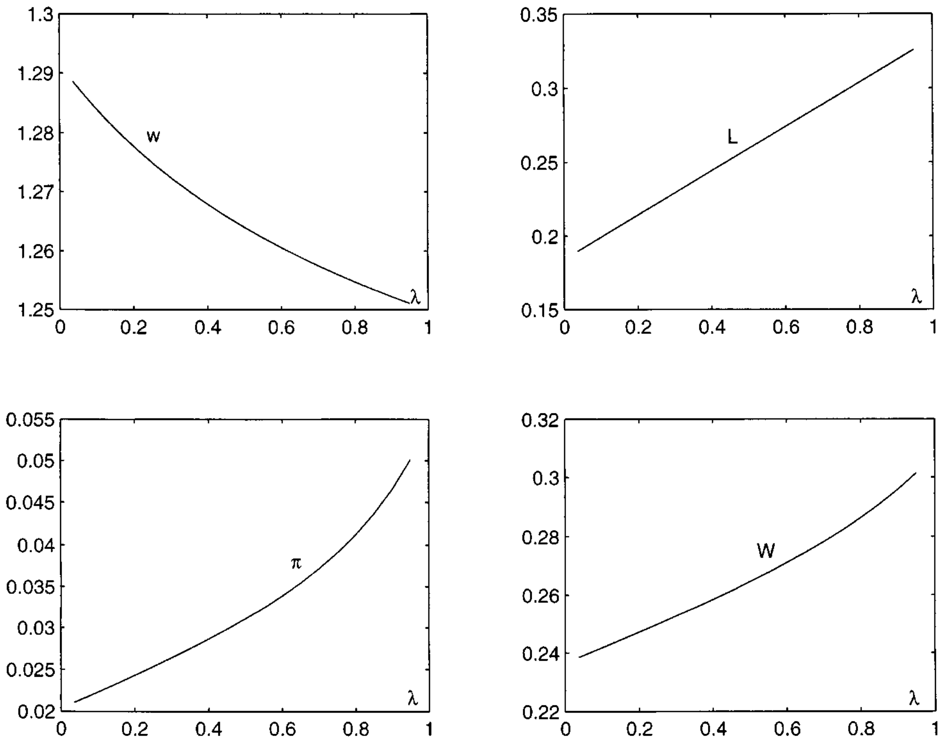

Figure 4. Wage, employment, profit, and welfare as a function of λ.

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Notes

1. Sørensen (1994) also studies the case of asymmetric labor markets but, due to the method of modeling integration, the resulting effects of integration are very extreme. If, for instance, a unionized economy integrates with a nonunionized economy, all firms in that particular industry move to the nonunionized economy.
2. In the Appendix, it is shown by numerical simulations that we find similar results when λ is endogenized by the approach used in Munch and Sørensen (1999).
3. This is a very extreme way to model a labor market asymmetry. A more reasonable way would perhaps be to assume that the bargaining power of trade unions differs across countries. This could be modeled as a difference in the parameter of bargaining power in a generalized Nash product. However, by using that approach, we would not be able to find analytical results. Hence, we restrict attention to the extreme case described above, which is without loss of generality because the essential point is that trade unions push for higher wages in one country than in the other.
4. This is what Brander and Spencer (1988) term *decentralized behavior*.
5. It is easily found that $\frac{\partial \pi}{\partial \lambda} = -\frac{1}{36\beta}(\alpha - w)^2 + \frac{2}{9\beta}(\tilde{w} - w)[2\alpha - 2w + \tilde{w}]$, which is unambiguously negative unless w is "much" lower than $\tilde{w}$. However, we focus on the case where the domestic wage (w) is at least as high as the foreign wage $(\tilde{w})$.
6. If, for instance, w equals its maximum value from (25), then $\frac{\partial W}{\partial \lambda} = -\frac{3(\alpha-1)^2}{32\beta}$.
7. The fourth term is negative if $\tilde{n} > n + 1$. Since we know that if $\tilde{w} = w$, then $\tilde{n} = n$, it follows that only if $w - \tilde{w}$ is sufficiently large will it be the case that $\tilde{n} > n + 1$.
8. These results are shown analytically in the Appendix.
9. This result is shown in the Appendix.

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